REMARKS

The final Office Action mailed November 14, 2007 has been carefully reviewed and the following response has been made in consequence thereof

Claims 1-8 are now pending in this application. Claims 1-8 stand rejected.

The rejection of Claims 1, 3-5, 7, and 8 under 35 U.S.C. §103(a) as being unpatentable over Wyman et al. (U.S. Pat. No. 7,106,891) ("Wyman") in view of Ayala et al. ("Spatial Size Distributions: Applications to Shape and Texture Analysis," IEEE, December 2001, pp. 1430-1442) ("Ayala") is respectfully traversed.

Wyman describes a method and system for determining convergence when registering image sets. A computed tomography (CT) image set (110) and a magnetic resonance image (MRI) image set (105) are received (410) by an Enhanced Image Registration System (EIRS) (120). The EIRS (120) compares (420) the two image sets, for example, by using Mutual Information, and performs (425) multiple transformation iterations on the CT image set (110) to align it with the MRI image set (105). The EIRS (120) then determines (430 and 440) when the image sets (110 and 105) are sufficiently aligned using convergence techniques. The image sets (110 and 105) are considered to be aligned when the magnitude of the transformation has converged as determined by comparing a convergence value to a predetermined threshold (t). More specifically, the EIRS (120) determines (430) the magnitude of the transformations performed by examining specific points within the CT image set (110) after each transformation. When the change in magnitude between succeeding transformations is below the predetermined threshold (t), the EIRS (120) determines (440) that the magnitude of transformation has converged. The aligned image sets (110 and 105) are output (450) from the EIRS (120) to generate a transformed CT image set (125) that is aligned with the MRI image set (105).

Notably, Wyman does not describe or suggest selecting a candidate image, which shares the largest amount of mutual information with the reference image, from among the plurality of candidate images. Rather, Wyman describes that at step 450 "the registration process is complete and the aligned second image set is outputted from the EIRS." See Wyman at column 10, lines 12-13. As such, Wyman describes extracting a first set of images and aligning them with a reference image to form a second set of images. Wyman further

describes outputting the second set of images, but does not describe or suggest outputting an image selected from the first set of extracted images.

Ayala describes a method of analyzing shapes and textures within images. Granulometric analysis is combined with the comparison of an original image and its granulometric transformation to classify texture. Ayala describes that granulometry and granulometric size distributions are used to define probability distributions for binary and gray-scale images. Notably, Ayala does not describe nor suggest extracting a plurality of candidate images similar to a reference image from among a plurality of images by utilizing granulometry. Further, Ayala does not describe nor suggest calculating mutual information shared by each of the transformed candidate images and a reference image. Moreover, Ayala does not describe nor suggest selecting a candidate image, which shares the largest amount of mutual information with a reference image, from among a plurality of candidate images.

Claim 1 recites an image processing method comprising the steps of "extracting a plurality of candidate images similar to a reference image from among a plurality of images by utilizing granulometry; transforming the plurality of candidate images on the basis of the reference image; calculating mutual information shared by each of the transformed candidate images and the reference image; and selecting a candidate image, which shares the largest amount of mutual information with the reference image, from among the plurality of candidate images."

Neither Wyman nor Ayala, considered alone or in combination, describes or suggests a method that includes selecting a candidate image, which shares the largest amount of mutual information with a reference image, from among a plurality of candidate images. Rather, in contrast to the present invention, Wyman describes outputting a second image set that is registered and aligned with a reference image set, and Ayala describes that granulometry and granulometric size distributions may be used to define probability distributions for binary and gray-scale images.

Accordingly, for at least the reasons set forth above, Claim 1 is submitted to be patentable over Wyman in view of Ayala.

Claims 3 and 4 depend from independent Claim 1. When the recitations of Claims 3 and 4 are considered in combination with the recitations of Claim 1, Applicants submit that Claims 3 and 4 likewise are patentable over Wyman in view of Ayala.

Claim 5 recites an image processing apparatus comprising "an extracting means for extracting a plurality of candidate images similar to a reference image from among a plurality of images by utilizing granulometry; a transforming device for transforming the plurality of candidate images on the basis of the reference image; a calculating device for calculating mutual information shared by each of the transformed candidate images and the reference image; and a selecting device for selecting a candidate image, which shares the largest amount of mutual information with the reference image, from among the plurality of candidate images."

Neither Wyman nor Ayala, considered alone or in combination, describes or suggests an image processing apparatus that includes a selecting device for selecting a candidate image, which shares the largest amount of mutual information with a reference image, from among a plurality of candidate images. Rather, in contrast to the present invention, Wyman describes outputting a second image set that is registered and aligned with a reference image set, and Ayala describes that granulometry and granulometric size distributions may be used to define probability distributions for binary and gray-scale images.

Accordingly, for at least the reasons set forth above, Claim 5 is submitted to be patentable over Wyman in view of Ayala.

Claims 7 and 8 depend from independent Claim 5. When the recitations of Claims 7 and 8 are considered in combination with the recitations of Claim 5, Applicants submit that Claims 7 and 8 likewise are patentable over Wyman in view of Ayala.

For at least the reasons set forth above, Applicants respectfully request that the Section 103 rejection of Claims 1, 3-5, 7, and 8 be withdrawn.

The rejection of Claims 2 and 6 under 35 U.S.C. §103(a) as being unpatentable over Wyman in view of Ayala, and further in view of Nakajima et al. (U.S. Pat. No. 5,623,560) ("Nakajima") is respectfully traversed.

Wyman and Ayala are described above. Nakajima describes a method for adjusting positions of radiation images. First and second phosphor sheets (5 and 7) are stacked with a filter (6) intervening therebetween. An object (4) is irradiated to generate first and second X-ray images on respective phosphor sheets (5 and 7). The phosphor sheets (5 and 7) are placed one after the other at a predetermined position in an X-ray image read-out apparatus (10). An

amount of emitted light (22) represented on the first phosphor sheet (5) is converted to an electric signal (SO1), and an electrical signal (SO2) is similarly generated from the second phosphor sheet (7). The electric signals (SO1 and SO2) are used to transform coordinates in the first X-ray image with affine transformation. The affine transformation simultaneously carries out enlargement or reduction, rotation, and/or parallel translation of the first X-ray image. As such, the first X-ray image is superimposed on the second X-ray image. Notably, Nakajima does not describe nor suggest selecting a candidate image, which shares the largest amount of mutual information with a reference image, from among a plurality of candidate images.

Claim 1 is recited above.

None of Wyman, Ayala, and Nakajima, considered alone or in combination, describe or suggest a method that includes selecting a candidate image, which shares the largest amount of mutual information with a reference image, from among a plurality of candidate images. Rather, in contrast to the present invention, Wyman describes outputting a second image set that is registered and aligned with a reference image set, Ayala describes that granulometry and granulometric size distributions may be used to define probability distributions for binary and gray-scale images, and Nakajima describes an affine transformation that simultaneously carries out enlargement or reduction, rotation, and/or parallel translation of an X-ray image.

Accordingly, for at least the reasons set forth above, Claim 1 is submitted to be patentable over Wyman in view of Ayala, and further in view of Nakajima.

Claim 2 depends from independent Claim 1. When the recitations of Claim 2 are considered in combination with the recitations of Claim 1, Applicants submit that Claim 2 likewise is patentable over Wyman in view of Ayala, and further in view of Nakajima.

Claim 5 recites an image processing apparatus comprising "an extracting means for extracting a plurality of candidate images similar to a reference image from among a plurality of images by utilizing granulometry; a transforming device for transforming the plurality of candidate images on the basis of the reference image; a calculating device for calculating mutual information shared by each of the transformed candidate images and the reference image; and a selecting device for selecting a candidate image, which shares the largest

amount of mutual information with the reference image, from among the plurality of candidate images."

None of Wyman, Ayala, and Nakajima, considered alone or in combination, describe or suggest an image processing apparatus that includes a selecting device for selecting a candidate image, which shares the largest amount of mutual information with a reference image, from among a plurality of candidate images. Rather, in contrast to the present invention, Wyman describes outputting a second image set that is registered and aligned with a reference image set, Ayala describes that granulometry and granulometric size distributions may be used to define probability distributions for binary and gray-scale images, and Nakajima describes an affine transformation that simultaneously carries out enlargement or reduction, rotation, and/or parallel translation of an X-ray image.

Accordingly, for at least the reasons set forth above, Claim 5 is submitted to be patentable over Wyman in view of Ayala, and further in view of Nakajima.

Claim 6 depends from independent Claim 5. When the recitations of Claim 6 are considered in combination with the recitations of Claim 5, Applicants submit that Claim 6 likewise is patentable over Wyman in view of Ayala, and further in view of Nakajima.

For at least the reasons set forth above, Applicants respectfully request that the Section 103 rejection of Claims 2 and 6 be withdrawn.

In view of the foregoing amendment and remarks, all the claims are now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully submitted,

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